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BIOLOGICAL EVALUATION

Disease and Insect Losses

Mt. Pinos Ranger District, Los Padres National Forest

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January 1978

INTRODUCTION

At the request of the District Ranger, Dave Hammond, an examination of selected areas of the Mt. Pinos Ranger District, Los Padres National Forest, was conducted by Ed Wood, plant pathologist, John Pierce and Dave Schultz, entomologists of the FIDM Staff, R-5, accompanied by District personnel, on August 8, 9, 10, and 11, 1977. The six areas examined will be presented individually below.

Characteristics of Stands Managed to Minimize Insect and Disease Losses.

One of the goals of the Southern California Timber Management Plan is to maintain stands in an insect-and disease-free condition, and prevent outbreaks of damaging pests. Certain stand attributes contribute to attainment of this goal, including stocking level, species composition and size class distribution.

Overstocked stands are often thinned by build ups of bark beetles, starting in trees of low vigor, but spreading, given favorable conditions, to healthy trees. The result is often a thinning, but not one which the land manager is pleased about; trees are killed in clumps, leaving openings in the stands which may gradually increase in size as trees are killed around the margin. On the other hand, a stand which has had the weak trees removed, and where the remaining ones have plenty of growing space, seldom has significant mortality due to bark beetles. Low stocking is especially important to the maintenance of healthy stands in the Southern California forests, which are not being managed for maximum fiber production and which have more unfavorable growing conditions than stands in other parts of the State.

In general, a stand with several species, especially hardwoods and softwoods, is healthier than a stand composed of one or few species. Spread of diseases is usually much slower in such stands because the roots and crowns of non-susceptible species serve as barriers to spread. Fortunately, many pests are restricted to their host range, attacking one to few species. Another advantage of mixed stands is that if an epidemic does occur, there will be a stand remaining even if one species is eliminated from the stand. In short, this is an example of hedging a bet.

Another hedge is all-aged distribution, or as close to all-aged as possible. Uneven age old-growth stands allow for the periodic removal of high risk trees without severe impact to the stand. Younger trees are present to replace the "old guard" as they fade out of the picture. As noted elsewhere, however, uneven-aged management is often not practical when dwarf mistletoe is present.

1. MIL POTRERO

This area is composed of two camps leased to community groups and the area adjacent to one of them, located east and west of Pine Mt. Center. Mil Potrero to the west is under a special use permit to the city of Taft and is located in a stand of Jeffrey and pinyon pine ranging in size from saplings to mature sawtimber. Stocking ranges from low to very high. Mortality in and around the camp is extremely high; the camp manager stated that as many as 60 dead trees had been removed from the campground in a single year. It is assumed that additional small trees have been removed by campers. The mortality in the camp, although located throughout, occurs mainly around at least eight identifiable centers inside the loop road and three more outside it. The root rot caused by Fomes annosus has been confirmed in ten of the centers. Attacks by the California flatheaded borer (Melanophila californica) and Pityogenes sp. were common in the dead trees. Observations made over the last year indicate that the fungus is continuing to spread outward from the points of initial infection, and, in fact, two of the centers have coalesced. Since both Jeffrey and pinyon pines are affected, the areas within the centers are left bare except for a few native live oaks. The reason for the high infection rate is unknown, but may be due to a combination of initial cutting made in order to construct the campground, root wounds made in the course of ditching for waterlines, or disturbance caused by camper use.

The probable course of events if nothing is done that the fungus will continue to spread, gradually reducing the stocking in the campground until it is thinly stocked. There is no reason to believe that roads will stop the fungus, since they are narrow and for the most part unpaved. In fact, the fungus has already moved across a road in two places.

Measures which have been tried for controlling the spread of Fomes annosus in somewhat similar situations include trenching, removal of infected stumps and roots, fumigation, or a combination of all three. The results of one study indicated that trenches are not necessary to eliminate F. annosus from an arboretum in order to regenerate, and do not stop spread of the fungus. Removal of stumps and roots followed by annual fumigation may be adequate to prepare centers for replanting, but does not stop spread of the fungus. Trenching, stump removal, and yearly fumigation is obviously an expensive and disruptive process, and would be difficult to accomplish in a campground without having a serious impact on its appearance. Stump treatment with borax, currently done on a routine basis in the campground, is an effective means of preventing air borne infection of pine stumps, but will not prevent root infection, nor will it eradicate the fungus from stumps already infected. Thus, it will not stop the spread of the fungus in existing centers but will assist in preventing the establishment of new centers.

This last spring, Jeffrey pines were planted in and around existing centers in the camp. Experience gained in other areas indicates that roots of the planted pines will contact roots of infected stumps in the centers, and

become infected. All conifers which might possibly survive are susceptible to F. annosus, although the degree to which giant sequoia is susceptible is not known, nor is it known if the fungus will pass from pine roots to planted sequoias. Hardwoods, on the other hand are not susceptible to F. annosus. Native hardwoods which might be planted include black oaks, live oaks, and cottonwoods.

Viable alternatives which might be followed in the camp then, include the following:

1. Do nothing except remove dead trees and treat stumps with borax. This will ultimately result in large unstocked areas of the camp.

2. Remove dead trees and stumps, and fumigate. This may or may not be effective and would badly disrupt the area, but might allow replanting of pines. The result would be much the same as in 1 above.

3. Remove dead trees, treat stumps with borax, and replant with non-susceptible species such as black oak, live oak, and cottonwoods. Exotic hardwoods might be planted, but District personnel stated a desire to use native vegetation whenever possible. This alternative would allow regenerating the site, with a shift toward a hardwood stand instead of pine stand, a shift which might not be desirable from the aesthetic viewpoint. At some time in the future, the older portions of infection centers will become inactive as the fungal food base runs out. At that time, which is now unknown, pines could be replanted. Enclosed is a reproduction of pertinent pages of a handbook of seeds of woody plants which might help in propagating oaks (enclosure 1).

Dwarf mistletoe (Arceuthobium campylopodum) was found in a few Jeffrey pines on the south side of the campground. In general, the infections are light and should not pose a problem, but several older trees standing within the upper, southern loop contain large brooms in the lower crown, and have thin crowns above. This indicates that the mistletoe is having an impact on these trees, and in fact one of them has died.

Alternatives include:

1. Do nothing. These trees will probably die within the next 10 years, leaving a sparse stand of small trees infected with dwarf mistletoe.

2. Prune the brooms from these trees, leaving infections which have not formed brooms. This could be accomplished by pruning either from a cherry picker or by a tree climber. The probable result would be that the overstory trees will recover, at least to the point where they will provide shade and a view for at least ten years (enclosure 2). The higher infections will continue to shower seed down on any understory, so that any pines within 100-150 feet will probably become infected. It is not practical to attempt broom pruning on the margins of F. annosus centers, since the fungus will kill the trees anyway.

3. Prune all overstory infections. This is expensive, will make the trees unsightly, and is difficult to accomplish because of the presence of latent infections which appear several years after pruning. It also is probably not necessary if oak is interplanted in the area. It does not appear to be as attractive an alternative as 2.

4. Remove the infected overstory trees, prune infected understory trees and replant conifers and/or hardwoods. This would allow regeneration of pine but would remove the large, desirable overstory trees.

The area adjacent to the camp leased to the city of Taft is not now a developed area but rather is in full view of a major road and is a desirable site for development. It has been examined within the past year and was found to have the same pest problems as are found in the campground. Accordingly, development of this area would probably produce the same situation as is now found in the campground.

The second organization camp, a YMCA camp located east of Pine Mt. Centers, contains one large F. annosus mortality center or possibly two centers which have joined. The large number of stumps of different ages indicate that this center has been active for many years. Five trees died this year on the margin of this center. Two of the five trees displayed signs and symptoms typical of F. annosus. This center can be expected to continue to spread down into the creek bottom on one side, and probably up the creek, but is prevented on the other two sides by a building and a natural clearing. There are oaks present in the immediate area, indicating a good chance of success if they are planted in the center. The same alternatives apply in the YMCA camp as were considered viable at Mil Potrero Park.

II. MT. PINOS

The Mt. Pinos area is about three miles by about one mile, at elevations ranging from about 7500' to 8800'. Jeffrey pine is the primary species, but there is a good component of white fir in some drainages. The stands vary from pole-sized to what might be considered overmature, with a large component of two-storied stands. The area was part of a sanitation-salvage sale made around 1962-63. Mt. Pinos is a high use recreation area, including two campgrounds and a popular winter sports area at the end of the road below Mt. Pinos.

The procedure for evaluating the Mt. Pinos area was to drive the main highway from Cuddy Valley to Mt. Pinos looking for problem areas and noting the diseases and insects which appeared to be affecting the stands. Stops were made in order to look closer at problems observed while driving. In addition, stops were made at each of the campgrounds and the winter sport areas. We walked through each of the areas, looking for problems and evaluating the results of previous control efforts.

Winter Sports Area and Mt. Pinos Highway

The overstory is old-appearing, flat-topped Jeffrey pine, with pockets of sapling and young-pole sized Jeffrey pines scattered throughout. The stands in this area appear largely free of pest problems. There is a small amount of limb rust caused by Peridermium stalactiforme in Jeffrey pine, and true mistletoe, Phoradendron bolleanum ssp. pauciflorum, in old-growth white fir. The limb rust is scattered throughout the stands, but does not appear to be a problem except in the high use areas, where it has been recognized by District personnel, and has been pruned out when necessary. The true mistletoe is more widespread and appears to be causing much more damage, judging from the number of spike tops found in the area. Unfortunately, there is no control for this parasite, and since it attacks the most valuable trees in the stand, tree removal would not accomplish the objectives for these stands. Enclosed is a copy of a manuscript which documents the current state of our knowledge of mistletoe (enclosure 3).

One F. annosus center was identified next to the Mt. Pinos highway, but in general the root rot does not appear to be a management problem in this area.

Besides the above noted problems, these stands appear healthy. The overstory trees are often flat-topped and very limby, but their appearance seems to be due to high winds rather than to low vigor. Several of the pole-sized stands below the end of the road, however, are overstocked to the point that bark beetles will probably cause significant mortality in the near future.

Alternatives

1. Do nothing. Mortality will occur in patches due to Ips attacking overstocked stands.

2. Thinning and slash treatment. Will provide control over the final stocking and composition, and should prevent "emergency" situations where direct control is required. We suggest a low final stocking for these stands followed by slash treatment designed to prevent build-ups of Ips populations. Populations are normally low during the early spring and it is important to avoid creating a desirable breeding habitat at a time when it is critical for the insect's survival. Therefore, slash created in the spring should be piled and burned or chipped within one month. Slash created in summer or fall can also be piled and burned or chipped, or may be lopped and scattered in sunny places, since it will dry too rapidly to produce heavy broods.

III. MT. PINOS CAMPGROUND

Four faded trees were observed in this small campground. Examination indicated that there were three F. annosus centers, two of them just outside

the loop road and one inside it. One of the centers outside the loop is probably beneficial; it is clearing the view down into Lockwood Valley. The other two centers will probably continue to be a problem for some time to come. Alternatives are:

1. Do nothing. This would result in large unstocked areas in the campground.

2. Removal of dead trees, treating the stumps with borax, and replanting with hardwoods. This will not stop mortality, but will allow restocking the campground as the disease center spreads.

IV. MCGILL CAMPGROUND

This campground is heavily used, and with good reason. It is located on a flat-ridge top with excellent views to the north, east and south. The natural stand is almost pure Jeffrey pine, heavily stocked with an old-growth overstory and a pole-sized understory in the northern and western part of the campground and sparsely stocked with the same size classes in the eastern and southern portions.

In the past, sanitation salvage and pruning have been done in the campground and in the area surrounding it, mainly to control dwarf mistletoe but also to remove hazard trees, hazard limbs, and high risk trees. The main pest problem in this campground is dwarf mistletoe in Jeffrey pine. While the parasite is found in almost all parts of the campground, it is especially heavy in the eastern and southern portions, those areas which are not heavily stocked. The low stocking in fact, is probably due to the mistletoe. Many of the trees in this area have dwarf mistletoe ratings of heavy or very heavy. A number of them contain large brooms, in spite of past control efforts. Alternatives are:

1. Do nothing. The dwarf mistletoe, already heavy enough to cause growth loss and contribute to mortality, will increase. The poorly stocked southern and eastern portions of the campground will eventually be cleared of pines, and the pathogen will start affecting trees in other, now lightly affected, areas of the campground.

2. Broom pruning. There is evidence from the southwest that pruning large brooms from pines restores them to a more vigorous condition (enclosure 2). Only large brooms are pruned, leaving branches having plants only. Pruning is done from a boom crane or by climbing the trees. If this option is chosen, the pruned trees can be expected to maintain or increase their growth rate. We bored several pruned trees in this campground as well as some that had not been pruned and found that pruned trees did appear to be in a healthier condition than non-pruned trees.

3. Pruning of infected branches. This will not necessarily increase the vigor of the pruned tree, but can be done in order to prevent infection of the understory. Unfortunately, it is difficult to remove all plants from the tree (actually, only the female plants need be removed), either because some plants are not visible or because removing a large number of branches renders the tree unsightly. If this alternative is carried out, only limited success can be expected; often the understory is already infected, and follow-up control is necessary in order to prune out latent infections.

   A variation of pruning has been attempted with heavily infected saplings from 10-20 feet tall. The upper 8-10 feet (or less) is pruned, leaving the naked leader and a skirt of infected foliage in the lower crown. After about five years, when a new crown has developed, the infected skirt is removed (enclosure 4). This pruning results in a temporarily unsightly tree and, depending on the amount of crown remaining, some mortality, but it appears to be a method of eradicating mistletoe in an infected understory following removal of an infected overstory. Surprisingly, full, normal crowns can result from this treatment.

4. Tree removal. May be done in order to prevent infection of an understory or allow regeneration of a susceptible tree species. Dwarf mistletoe seeds are propelled forcibly from the plants and travel horizontally for a distance from the source usually equal to or slightly greater than the height of the plants in the overstory, although wind patterns affect the pattern and distance of dispersal. Therefore, any attempt to prevent infection of an understory, or to establish healthy pine regeneration, will fail unless an infested overstory is removed.

5. Thinning. Some of the effects of dwarf mistletoe can be alleviated by a thinning designed to remove the heaviest infected trees and provide better growing conditions for the more lightly infected residuals. A side benefit of thinning is that fast growing trees can outgrow the dwarf mistletoe because the mistletoe grows upward in the crowns of trees at a relatively slow rate. Research has shown that white fir growing more than 4" per year will eventually outgrow mistletoe. Unfortunately, there are no corresponding figures for pine. It is assumed that since pine crowns are less dense than white fir crowns, that the rate of vertical spread is faster in pine and therefore growth must be more than 4", but how much more is not known.

6. Buffer strips. Dwarf mistletoes are restricted in their ability to spread from one species to another. Pine mistletoe will spread between Jeffrey, ponderosa, and Coulter pines, but not to other species. Therefore, non-susceptible conifers and hardwoods can be regenerated

in a buffer strip under and around infected pines. The width of the buffer strip is generally considered to be equal to the height of the highest dwarf mistletoe plants, but the width of the strip should be increased on the downwind sides of infected trees. If susceptible trees are planted too close to infected trees and themselves become infected, they should be removed.

Areas within the campground were observed where combinations of the above alternatives appear feasible, such as 2 and 4, 3 and 4, 2,4 and 5, or 2,4,5 and 6. The alternatives or combinations selected to be used in a given aggregation will be influenced by the need to maintain crown cover in the campground.

Fomes annosus is not now a problem in this campground. One possible center is located near the entrance. This area has been planted to giant sequoia, which appears to be growing at a satisfactory rate. The susceptibility of sequoia to F. annosus is not known; it is possible that the fungus acts as a root rot, predisposing trees to windthrow in much the same way as it does in incense-cedar. Giant sequoia, therefore cannot be recommended for planting in recreation areas until its susceptibility to the root rot is known. All conifer stumps created in the campground should be immediately treated with borax in order to prevent the introduction of the fungus.

V. TECUYA, WEST TECUYA, AND SAN EMIGDIO

Although these three areas are somewhat separate, they have similar topography, vegetation, and pest problems, and will be discussed as a unit. These stands are located on the top and upper slopes of a east-west oriented ridge north of the San Andreas Fault. Vegetation consists of an overstory of mature and overmature Jeffrey pine with a small amount of white fir, and an understory of pole or sawtimber-sized Jeffrey pine, white fir, pinyon pine and juniper. The overstory in most areas is low in vigor, heavily infected with dwarf and true mistletoe, but contributes significantly to the aesthetic value of the area. A timber sale has been marked in Tecuya and West Tecuya, and some precommercial thinning has been done recently. The sale was marked using beetle susceptibility risk classes (FSM 2471.23, R-5 Supp. 108), but without criteria for consideration of risk class 6, the disease risk class. Dwarf mistletoe is an important agent predisposing trees to bark beetle attack. The enclosed chart (enclosure 5) shows the standard dwarf mistletoe rating system used throughout the West. We suggest that it be used with the risk classes in the following way; all trees in dwarf mistletoe infection levels 5 and 6 (high level) can be considered very high risk, or risk class 6. Trees with infection levels of 3 and 4 (medium level) are high risk, if their other characteristics are normal, such as crown shape, needle color and vegetation. If however, the crown is flat, needles shorter than normal, with less than normal needle retention, then the probability is high that the dwarf mistletoe will accelerate the decline of the tree and hasten its death. Accordingly, such trees should also be assigned to a very high risk class or class 6, and removed. It has been shown that witches brooms cause a larger reduction in growth than do plants without brooms. This should be taken into consideration when deciding on risk classes.

Besides having a significant effect on growth, and therefore vigor, of overstory trees, the infections in such trees serve to spread mistletoe to surrounding understory trees of the same species. Accordingly, the same factors are operating here as are present in McGill Campground; as long as an infected overstory remains, the understory will become infected. If one of the objectives of the sale is to reduce the level of dwarf mistletoe in the area, and increase the vigor of the younger trees in the stand, removal of infected overstory trees is necessary. We feel that in order to improve the vigor of these stands, many more overstory trees infected by dwarf mistletoe should be removed.

Fomes annosus root rot was found in three places. A large center is located in Marion Campground, and has seriously reduced the stocking there. The possible alternatives which exist for this area are the same as for the institutional camps near Mil Potrero. Another center is in Pinyon Pine at West Tecuya. It is a large center, about 4-5 acres, and has caused serious blowdown. Since it is the only center so far found in this area in this species, it is of interest mainly as a curiosity, and at this time is not a management problem.